

**STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION**

STAFF REPORT FOR REGULAR MEETING OF DECEMBER 4 - 5, 2008

Prepared on October 27, 2008

ITEM NUMBER: 17

SUBJECT: Olin Groundwater Cleanup, Santa Clara County-
Status Report

KEY INFORMATION

Location: 425 Tennant Avenue, Morgan Hill, California, approximately 30-miles southeast of San Jose and 0.5-miles west of Highway 101.

Responsible Party: Olin Corporation Inc.

Current Owner: Olin Corporation Inc.

Type of Operations: Manufacture of Signal Flares

Type of Discharge: Potassium Perchlorate

Existing Orders: Cleanup Order

Cleanup and Abatement Order (CAO) No. R3-2007-0077

Replacement Water Orders

Cleanup and Abatement Order No. R3-2004-0101

State Board Order No. WQ 2005-0007

General Waiver of Waste Discharge Requirements:

Resolution No. R3-2002-0115 (General Waiver)

Monitoring and Reporting Program

Monitoring and Reporting Program No. R3-2008-0028

THIS ACTION: Status Update – Information item only

SUMMARY:

This staff report provides an update on the status of the Olin groundwater cleanup site addressing the following items:

- Cleanup status and Olin's compliance with Cleanup and Abatement Order No. R-3-2007-0077 (Cleanup Order No. R3-2007-0077).
- The City of Morgan Hill's petition of Cleanup Order No. R3-2007-0077;
- Replacement water terminations.
- Installation of wellhead treatment through ion exchange.
- Changes to the monitoring and reporting program.
- Perchlorate Community Advisory Group efforts and changes.
- Background information about perchlorate, and Olin site history and hydrogeology.

New information since the last staff report is depicted in *italics*.

Olin is making progress in implementing hydraulic containment of perchlorate in groundwater that exceeds 11 micrograms per liter ($\mu\text{g/L}$) in the intermediate drinking water aquifer downgradient of the Olin site. Startup of the offsite intermediate aquifer hydraulic containment system is required by October 2009. Olin is finalizing its characterization activities of the lower deep aquifer southeast of the Olin site and will install an offsite upper/middle deep aquifer extraction well by the end of December 2008 to contain perchlorate in groundwater exceeding 24.5 $\mu\text{g/L}$. Startup of the upper/middle deep aquifer extraction well is anticipated to be late 2009.

DISCUSSION:

General Perchlorate Information

Perchlorate occurs both naturally and as a man-made chemical. One-third of all perchlorate used in the United States is used in California and 90% of California's perchlorate use is related to the aerospace industry. There are three major sources of perchlorate in the United States:

1. Ammonium perchlorate, used as an oxidizer in solid rocket propellants,
2. Sodium perchlorate, used in slurry explosives, and
3. Potassium perchlorate, used in road flares and air bag inflation systems.

Wastes from the manufacture and improper disposal of perchlorate-containing chemicals are increasingly being discovered in soil and water.

Health Effects

Perchlorate interferes with the natural function of the thyroid gland by inhibiting the uptake of iodide. Because iodide is an essential component of thyroid hormones, perchlorate disrupts how the thyroid functions. Such an effect decreases production of thyroid hormones, which are needed for prenatal and postnatal growth and development, as well as for normal body metabolism. Potassium perchlorate was used until recently to treat hyperthyroidism related to Graves disease, and is still used diagnostically to test thyroid hormone production in some clinical settings.

Regulatory Standards

Perchlorate is a regulated drinking water contaminant in California, with a maximum contaminant level (MCL) of 6 micrograms per liter ($\mu\text{g/L}$), effective October 18, 2007. *The U.S. Environmental Protection Agency conducted extensive review of scientific data related to the health effects of exposure to perchlorate from drinking water and other sources and found that in more than 99 percent of public drinking water systems, perchlorate was not at levels of public health concern. Therefore, based on the Safe Water Drinking Act criteria, the agency determined there is not a "meaningful opportunity for health risk reduction" through a national drinking water regulation. The agency is seeking comment on its preliminary determination not to regulate perchlorate in drinking water at a national level. USEPA will make a final determination for perchlorate after considering information provided in the 30-day public comment period (by November 2008). USEPA's determination does not directly affect the Olin site because the State of California adopted a primary drinking water standard for perchlorate that applies to this site, both for purposes of providing alternative water supply for affected users and for purposes of determining the range of cleanup levels for the site consistent with State Water Board Resolution No. 92-49.*

Site Background

Olin Corporation (Olin) used potassium perchlorate to manufacture highway road flares from 1956 to 1995 at the Olin facility (site) located at 425 Tennant Avenue in Morgan Hill, Santa Clara County. Perchlorate entered groundwater from the site, which resulted in a groundwater plume that extends approximately 10 miles southeast and east of the site and over 500 feet deep downgradient of the site. Perchlorate has degraded groundwater in the shallow, intermediate, and deep aquifer zones of the Llagas Subbasin.

Geology/Hydrogeology

The former Olin site is located in the Llagas Subbasin of the Gilroy-Hollister Groundwater Basin in South Santa Clara County. Groundwater in the region typically occurs in alluvial sediments, at depths ranging from seven to about 570 feet below ground surface. The alluvial deposits are composed of heterogeneous layers of clay, silt, sand, and gravel. Interconnected multiple aquifers exist within the area. Groundwater underneath the site is generally unconfined, although there are identified confined zones within the sub-basin to the southeast of the property. In general, regional groundwater flow is toward the south in all three aquifers, except near large-capacity pumping wells where strong, localized gradient reversals exist in the lower intermediate and deep aquifers. Olin has included a detailed description of geology and hydrogeologic conditions within the Llagas Subbasin in their January 31, 2008, Llagas Subbasin Characterization – 2007, Santa Clara County Olin/Standard Fusee, Morgan Hill, California (2007 Characterization Report).

Residents, agricultural operations, businesses, and cities surrounding and downgradient of the former Olin site rely solely on groundwater for domestic, agricultural, and industrial supply purposes. The known perchlorate plume area extends for approximately ten miles downgradient. Historically, approximately 800 offsite wells have had perchlorate detections.

Status of Activities and Compliance with Cleanup Order No. R3-2007-0077

At the December 7, 2007 Water Board hearing, the Central Coast Water Board authorized the Executive Officer to issue Cleanup and Abatement Order No. R3-2007-0077 (Cleanup Order No. R3-2007-0077). Cleanup Order No. R3-2007-0077 requires Olin to complete offsite groundwater characterization and proceed with implementation of a phased groundwater cleanup. The approved cleanup remedy includes implementation of hydraulic containment and treatment of groundwater (i.e., pump and treat) in the area of highest concentrations combined with monitored attenuation for those areas with lower perchlorate concentrations.

To date, Olin remains in compliance with all tasks and submittal requirements in Cleanup Order No. R3-2007-0077. Olin is also in compliance with other existing orders and Monitoring and Reporting Program (MRP) No. R3-2008-0028. The table below provides a brief description of major technical submittals required by Cleanup Order No. R3-2007-0077 and the corresponding compliance status.

CAO Requirement	Compliance Status
E.1. By <u>December 31, 2007</u> – Install and test intermediate zone groundwater extraction well.	Intermediate aquifer extraction well (IEW-1) installed and tested as required. Olin completed this requirement on time.
E.2. By <u>March 28, 2008</u> – Install and test deep aquifer groundwater extraction well.	Water Board staff approved extension request, allowing for complete characterization of deep aquifer zone prior to installing deep aquifer extraction

	<i>well (DEW-1) by December 2008. Well DEW-1 will target the upper and middle deep aquifer zone. Olin proposes to install at least one additional deep aquifer well that will target the lower deep aquifer zone.</i>
<i>E.3. By <u>April 15, 2008</u> – Submit an Area I Plume Migration Control FS Addendum.</i>	<i>Water Board staff approved Olin's submittal. Olin completed this requirement on time.</i>
<i>E.4. By <u>April 15, 2008</u> – Submit an Intermediate Aquifer Zone Cleanup Work Plan for Priority Zones A and B.</i>	<i>Water Board staff approved Olin's submittal. Olin completed this requirement on time.</i>
<i>E.5. By <u>August 8, 2008</u> – Submit a 45% Engineering Design Package for the Area I System</i>	<i>Water Board staff approved Olin's submittal. Olin completed this requirement on time.</i>
<i>E.5. By <u>November 28, 2008</u> – Submit the 90% Engineering Design Package.</i>	<i>Olin requested an extension for submittal of this design package while it explores municipal re-use options for treated groundwater with the City of Morgan Hill. Water Board staff anticipates approving Olin's extension request in November, with the new due date for this document set for February 27, 2009.</i>

The following includes a brief groundwater cleanup status update for each aquifer.

- **Shallow Aquifer Cleanup Status** – Olin began operation of the onsite groundwater treatment system on February 23, 2004. Olin extracts groundwater, removes perchlorate with a perchlorate-specific ion exchange process, and re-injects the treated groundwater onsite into the shallow aquifer. *To date, Olin has removed perchlorate from over 245 million gallons of water for a total perchlorate mass reduction of approximately 78 pounds.*

Continuous operation of the onsite groundwater extraction and treatment system coupled with successful onsite soil remediation has effectively decreased the mass of perchlorate in the shallow aquifer (onsite and offsite). Our review of shallow groundwater data confirms that perchlorate concentrations in the shallow groundwater beneath and adjacent to the site are showing decreasing concentrations over the past three years. In mid-July 2008, Olin discontinued pumping its two existing shallow aquifer extraction wells due to declining water levels in the shallow aquifer, which resulted in water levels below the minimum submergence requirements for the pumps in the wells. Olin anticipates that water levels in the shallow aquifer will continue to decline until the seasonal rains begin this fall. Based on observed decreases in perchlorate concentrations in the two shallow extraction wells and the shallow monitoring network, coupled with the current status of the groundwater treatment system, Olin suggests that continuous hydraulic containment of the shallow aquifer is no longer necessary to satisfy the requirements of Cleanup Order No. R3-2007-0077. Water Board staff agreed with Olin's request to temporarily discontinue groundwater extraction in the shallow aquifer because: 1) insufficient water is available in the extraction wells to pump the wells, and 2) continuous operation of the two shallow extraction wells would likely not result in significant decreases in perchlorate concentrations in the shallow aquifer. As part of this shallow aquifer evaluation, we have required Olin to conduct monthly

sampling and collect water level measurements at various wells. If perchlorate concentrations show consistent increases in PM-01A, PM-02A, and PM-03A (see Attachment 2) for three consecutive months, Olin will be required to restart pumping from the shallow extraction wells.

- **Intermediate Aquifer Cleanup Status** - In accordance with Cleanup Order No. R3-2007-0077, Olin completed installation and hydraulic testing of an intermediate zone groundwater extraction well (IEW-1) and demonstrated that the extraction well will achieve complete hydraulic capture of Priority Zone A (perchlorate concentrations greater than 24.5 µg/L) and Priority Zone B (perchlorate concentrations greater than 11 µg/L) upgradient from the extraction well (See Attachment 3).

Olin will use IEW-1 to extract groundwater from the intermediate aquifer and transport extracted groundwater to the Olin site via a pipeline. Olin will treat the extracted groundwater with the onsite ion exchange system. For complete capture of Priority Zones A and B upgradient of IEW-1, Olin anticipates an extraction rate at IEW-1 of approximately 400 gallons per minute. Olin's initial plans included disposing of the treated water to the shallow aquifer via injection wells.

On September 11, 2008, Central Coast Water Board staff concurred with Olin's 45% Engineering Design Package for the Intermediate Aquifer Containment and Cleanup System. Central Coast Water Board staff approved Olin proposed design for hydraulic containment of perchlorate in groundwater that exceeds 11 µg/L in the offsite intermediate aquifer.

As mentioned above, Olin requested a three-month extension for submittal of the 90% Engineering Design Package for the Intermediate Aquifer Containment and Cleanup System, until February 27, 2009. Olin is exploring municipal re-use of treated groundwater as an alternative to re-injecting the treated water into the shallow aquifer. Municipal water supply systems vary significantly from a remedial system design, following specifications mandated by the California Department of Public Health (DPH) regulations. As such, Olin wants to be certain which system they will be building prior to proceeding further with the 90% design submittal. We support Olin's municipal re-use efforts, as this is a more energy-sustainable choice, consistent with Assembly Bill No. 32 and the Governor's mandate for the Air Resources Board to identify and implement ways to reduce greenhouse gas emissions. We anticipate approving this extension request in November. Although staff agrees with the proposed postponement for submittal of the 90% Design Package, we do not concede that this necessarily pushes back the startup date for the intermediate aquifer extraction/treatment system, targeted for late 2009. We have verbally communicated this expectation to Olin and will reiterate it in our forthcoming extension approval letter. We also understand that by selecting to convert to a municipal supply option, this option would significantly increase the number of issues beyond Olin's control that potentially could delay system startup (e.g., DPH permitting). We will continue to update the Board and public on the progress of the intermediate aquifer extraction/treatment system design, construction, and start up.

- **Deep Aquifer Cleanup Status** - Olin's April 15, 2008 Feasibility Study Addendum report included the results of the deep aquifer characterization activities and included a deep aquifer extraction well implementation schedule. Based on the results of characterization activities conducted during December 2007 and January 2008, Olin subdivided the deep aquifer into upper, middle, and lower deep aquifer zones. Based on these characterization activities, Water Board staff concurs with Olin that characterization of the Priority Zone A in

the upper and middle portions of the deep aquifer is sufficiently complete to propose a preliminary location for an upper/middle deep aquifer extraction well. Hence, Olin has proposed a preliminary location for an upper-middle deep extraction well (DEW-1), as shown on Attachment 4.

During September, Olin completed installation of three additional monitoring wells (MW-68, MW-69, and MW-70) to further characterize the deep aquifer. Additionally, Olin completed the installation of Performance Monitoring Well PMW-4. Olin will use the water quality and hydraulic data from PMW-4 and MW-70 to select a final location and design for the upper and middle deep aquifer extraction well (DEW-1). Olin will submit a Recommendation Letter detailing the final design and location of DEW-1 after the results from PMW-4 and MW-70 are available. In accordance with Olin's implementation schedule, Olin plans to install groundwater extraction well DEW-1 by December 2008 and begin groundwater containment (hydraulic control and cleanup) of the upper and middle deep aquifer zones in November 2009.

Olin will use data from the three new deep aquifer wells (MW-68, MW-69, and MW-70) and other wells to determine if the lower deep aquifer has been adequately delineated, such that containment and cleanup activities can proceed. If additional characterization is needed, Olin's 2008 Characterization Report (due by January 31, 2009) will provide the scope and schedule for additional lower deep aquifer characterization activities. If groundwater Water Board staff concurs with Olin that characterization is complete in the lower deep aquifer, lower deep aquifer containment and cleanup activities will proceed in a manner similar to the intermediate aquifer containment system.

Petition of Cleanup Order No. R3-2007-0077

The City of Morgan Hill (City) filed a petition with the State Water Board requesting review of Cleanup Order No. R3-2007-0077. The State Water Board received the City's petition on January 7, 2008. The City's petition had four main contentions and requested that the State Water Board order the Central Coast Water Board to require Olin to:

- 1. Provide replacement water for the Petitioner's Tennant Well (California Water Code § 13304);*
- 2. Employ the Tennant Well as part of the remediation of Area I, take all reasonable steps to protect the Tennant Well from being impacted by the perchlorate Olin discharged into the groundwater, and issue a CAO that could include the "payment for" uninterrupted replacement water service;*
- 3. Rescind any part of Cleanup Order No. 0077 that permits monitored attenuation; and*
- 4. Remediate the Llagas Subbasin to background, and to rescind any directive to Olin that permits a cleanup to 6.0 ppb anywhere in the Subbasin.*

The State Water Board dismissed the petition on October 16, 2008, concluding that "...the petition in this matter fails to raise substantial issues that are appropriate for review by the State Water Resources Control Board..."

Replacement Water Terminations

Private domestic supply well users in the Morgan Hill, San Martin, and Gilroy areas depend on well water as their main drinking water source. Olin continues to provide replacement water

(i.e., bottled drinking water or wellhead treatment with ion-exchange) to well owners and tenants whose wells have perchlorate concentrations greater than 6.0 µg/L. Olin provides replacement water in accordance with the Central Coast Water Board Cleanup and Abatement Order No. R3-2004-0101, as revised by the State Water Board Order WQ 2005-0007 (State Water Board Order) and a clarification letter issued by Central Coast Water Board staff's on October 6, 2006.

Central Coast Water Board staff continues to address all issues related to bottled water service termination and monitoring requirements after Olin terminates bottled water service. *To date, the Central Coast Water Board's Executive Officer concurred with Olin's request to terminate bottled water service for 661 domestic supply wells (including two wells that were fitted with an ion exchange [IX] system) in accordance with State Water Board Order requirements.*

Central Coast Water Board requires Olin to provide replacement water to well users for four quarters after perchlorate is detected greater than 6.0 µg/L. Central Coast Water Board staff will continue to review and evaluate all data submitted by Olin associated with bottled water termination requests and post-bottled water termination monitoring.

Between Second Quarter 2005 and Third Quarter 2008, the following changes occurred:

- *The number of wells where replacement water is required has decreased from 661 to 67, representing a 90 percent decrease.*
- *The number of replacement water accounts (including multiple accounts for some wells) has decreased from 914 and 103, representing an 89 percent decrease.*

Out of the 67 wells receiving replacement water, 24 domestic supply wells sampled during the third quarter of 2008, contained perchlorate concentrations above 6.0 µg/L.

Ion Exchange System Installations

Olin continues to operate and maintain ion exchange systems on 12 private domestic supply wells; the systems continue to remove perchlorate as designed. In accordance with the State Water Board Order, Olin removed two domestic ion exchange systems from service as replacement water because concentrations were below 6.0 µg/L for four consecutive quarters of monitoring, and one ion exchange system is off-line because the property is vacant.

Olin will continue providing bottled water to households supplied by wells equipped with ion exchange pending DPH acceptance of the domestic ion exchange systems. In January 2007, Olin submitted its ion exchange system pilot test protocol (Demonstration Protocol) to DPH and provided an update in May 2007. Olin submitted a second Demonstration Protocol report on November 15, 2007. All of the demonstration sites appear to be eliminating perchlorate from groundwater, as expected. MACTEC, on behalf of Olin, also conducts monthly inspections of the ion exchange systems. DPH review and approval on the first and second reports remain pending.

Central Coast Water Board staff continues to assist Olin in expediting DPH's evaluation process and helping obtain the necessary domestic IX system approvals. In a September 26th letter to DPH, Assemblymember John Laird requested that DPH complete its assessment as soon as possible.

Monitoring and Reporting Program (MRP) Revisions

Central Coast Water Board Executive Officer issued revised Monitoring and Reporting Program (MRP) No. R3-2008-0028 on August 8, 2008. This MRP replaces MRP No. 2003-0168 and

MRP No. 2001-161 for groundwater and treatment system monitoring and reporting. This MRP also updates the monitoring well network and the monitoring and reporting requirements for groundwater, perchlorate discharge, and onsite treatment system data.

Upcoming Reports

- *Monthly Progress Reports, due by the 10th of every month. Attachment 2 includes the most recent Monthly Progress Report.*
- *October 30, 2008 Third Quarter 2008 Groundwater Monitoring Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California (3Q2008 Monitoring Report).*
- *November 28, 2008 Area I 90% Engineering Design Package for the Intermediate Aquifer Containment and Cleanup System, postponed, as discussed above, until February 27, 2009.*

Perchlorate Community Advisory Group

The Perchlorate Community Advisory Group (PCAG) meets quarterly in San Martin. The advisory group is a forum for public discussion of the perchlorate plume, replacement water issues, associated impacts to the community and potential remedies, and progress toward cleanup. Central Coast Water Board staff solicits advisory group input at key decision points in the investigation and cleanup process.

Central Coast Water Board staff attended the September 12, 2008 afternoon PCAG meeting held in San Martin, and updated attendees on the current status of Olin's groundwater investigation and ongoing remediation, status of groundwater containment systems for the intermediate and deep aquifer zones, the overall cleanup implementation schedule, and updates on bottled water. PCAG also announced that the Santa Clara Valley Water District (SCVWD) will no longer be able to provide administrative support for PCAG and introduced Andria Ventura from Clean Water Action as the new administrative assistant for PCAG. Following notification by SCVWD of their future diminished role, Water Board staff contacted both Sylvia Hamilton of PCAG and Andria Ventura, in an effort to ensure ongoing support to PCAG. Water Board staff has also recently provided some logistical support for dissemination of materials on behalf of PCAG.

PCAG will hold their next meeting at the San Martin Lions Club on Friday, December 12, 2008, at 2 pm. Central Coast Water Board staff will attend and be available to address questions from the public concerning the ongoing Olin cleanup issues.

Next Update

Water Board staff plan to provide the next status update in Watsonville on July 10, 2009.

OLIN REPORTS AND SIGNIFICANT CORRESPONDENCE CAN BE ACCESSED ON THE CENTRAL COAST WATER BOARD WEBSITE AT:

<http://www.swrcb.ca.gov/rwqcb3/Facilities/Olin%20Perchlorate/Olinsite.htm>

ATTACHMENTS

1. Olin's Progress Report #75, dated November 10, 2008.
2. Figure showing Onsite Well Locations and Groundwater Treatment System Layout
3. Figure showing location of IEW-1.
4. Figure Showing location of DEW-1.